ABSTRACT

Multiple Catalyst System for Olefin
Polymerization and Polymers Produced Therefrom

This invention relates to a polymer comprising one or more C3 to C40 olefins, optionally one or more diolefins, and less than 15 mole % of ethylene, where the polymer has:

a) a Dot T-Peel of 1 Newton or more; and
b) a branching index (g') of 0.95 or less measured at the Mz of the polymer;
c) an Mw of 100,000 or less.

This invention also relates a polymer comprising one or more C3 to C40 olefins where the polymer has:

a) a Dot T-Peel of 1 Newton or more on Kraft paper;
b) a branching index (g') of 0.95 or less measured at the Mz of the polymer;
c) a Mw of 10,000 to 100,000; and
d) a heat of fusion of 1 to 70 J/g.

This invention also relates a polymer comprising one or more C3 to C40 olefins where the polymer has:

a) a Dot T-Peel of 1 Newton or more on Kraft paper;
b) a branching index (g') of 0.98 or less measured at the Mz of the polymer;
c) a Mw of 10,000 to 60,000;
d) a heat of fusion of 1 to 50 J/g.

This invention also relates to a homopolypropylene or a copolymer of propylene and up to 5 mole% ethylene having:

a) an isotactic run length of 1 to 30 (isotactic run length "IRL" is defined to be the percent of mmmm pentad divided by 0.5 x percent of mmmr pentad) as determined by Carbon 13 NMR, preferably 3 to 25, more preferably 4 to 20,

b) a percent of r dyad of greater than 20%, preferably from 20 to 70 % as determined by Carbon 13 NMR, and

c) a heat of fusion of 70 J/g or less, preferably 60 J/g or less, more preferably between 1 and 55 J/g, more preferably between 4 and 50 J/g.

This invention further relates to a process to produce an olefin polymer comprising:

1) selecting a first catalyst component capable of producing a polymer having an Mw of 100,000 or less and a crystallinity of 5% or less at selected polymerization conditions;

2) selecting a second catalyst component capable of producing polymer having an Mw of 100,000 or less and a crystallinity of 20% or more at the selected polymerization conditions;

3) contacting the catalyst components in the presence of one or more activators with one or more C3 to C40 olefins, at the selected polymerization conditions in a reaction zone;

4) obtaining the polymer.

This invention further relates to a continuous process to produce a branched olefin polymer comprising:

1) selecting a first catalyst component capable of producing a polymer having an Mw of 100,000 or less and a crystallinity of 5% or less under selected polymerization conditions;

2) selecting a second catalyst component capable of producing polymer having an Mw of 100,000 or less and a crystallinity of 20% or more at the selected polymerization conditions;

3) contacting the catalyst components in the presence of one or more activators with one or more C3 to C40 olefins, and, optionally one or more diolefins;

4) at a temperature of greater than 100°C;

5) at a residence time of 120 minutes or less;

6) wherein the ratio of the first catalyst to the second catalyst is from 1:1 to 50:1;

7) wherein the activity of the catalyst components is at least 100 kilograms of polymer per gram of the catalyst components; and wherein at least 20% of the olefins are converted to polymer.